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URANUS.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Apr. 1.	15 27	— 18 30	9 52 P.M.	2 47 A.M.	7 42 A.M.
11.	15 26	— 18 26	9 11	2 6	7 1
21.	15 24	— 18 21	8 30	1 26	6 22
May 1.	15 23	— 18 15	7 49	12 45	5 41

NEPTUNE.

Apr. 1.	4 58	+ 21 17	9 0 A.M.	4 16 P.M.	11 34 P.M.
11.	4 59	+ 21 19	8 22	3 38	10 54
21.	5 0	+ 21 21	7 44	3 0	10 16
May 1.	5 2	+ 21 23	7 6	2 23	9 40

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off right-hand limb, as seen in an inverting telescope.)

		H. M.			H. M.
III, D,	Apr. 2.	8 9 P. M.	II, R,	Apr. 14.	12 23 A. M.
III, R,	2.	11 41 P. M.	I, R,	15.	12 35 A. M.
II, R,	6.	9 48 P. M.	I, R,	16.	7 4 P. M.
I, R,	7.	10 40 P. M.	II, R,	21.	2 58 A. M.
I, R,	9.	5 9 P. M.	I, R,	22.	2 31 A. M.
III, D,	10.	12 9 A. M.	I, R,	23.	8 59 P. M.
IV, R,	13.	4 39 P. M.	I, R,	30.	10 55 P. M.

THE PHOTOGRAPHY OF PLANETOIDS, BY PROFESSOR MAX WOLF.

ABSTRACT BY DR. EDWARD S. HOLDEN.

The *Astronomische Nachrichten* No. 3319 contains an exhaustive paper by Professor MAX WOLF, of Heidelberg, on the photography of planetoids, based on his personal experience in the years 1891–1895. His work has been done with portrait lenses of five and of six inches aperture, with foci of twenty-five and of thirty inches, respectively. The lens is kept accurately pointed for exposures of one and one-half, or, better, two hours, and the stars appear as *dots* on the plate, while asteroids are distinguished by their (short) *trails*.

To draw safe conclusions from such observations, the plates must be in duplicate. If both plates are simultaneously exposed, errors on one plate may make the result doubtful. Professor WOLF prefers to expose plate A for one hour, then to begin the exposure of plate B, to close plate A after another hour, and, finally, to close plate B at the end of the third hour. Part of the space occupied by the *trail* of a planetoid on A will be vacant on plate B, and *vice versa.*

If a visual telescope of sufficient power is at hand, the shortest method is to expose one plate only, and to examine the sky with the visual telescope to resolve the doubtful points suggested by the plate. This is the method so successfully followed by M. CHARLOIS at Nice.

An important advantage of this method of research is the wide field covered by the portrait lens.*

For planetoids brighter than 12.6 magnitude, Professor WOLF finds that a field of some seventy square degrees is available under good conditions.

To compare two plates, A and B, both plates are laid on a retouching frame, one over the other, with both films downwards, and are then examined with a hand-glass. This method is found by Professor WOLF, after long experience, to be preferable to other processes, suggested by Messrs. E. C. PICKERING, BARNARD, and by WOLF and LENARD.

Whenever it is possible, the R. A. and Dec. of the planet should be obtained from visual observations, and not from plates made with portrait lenses of short focus. If portrait lenses of sixteen inches aperture and eighty-odd inches focus are available (such as the Heidelberg Observatory expects to possess), the case is different, and good positions can be had from the plates. The estimation of the magnitude of the planet from its *trail* requires long experience, and is always difficult. The measurement of positions on photographic plates is attended by a swarm of difficulties, which have been considered in detail by Professor WOLF in *Astronomy and Astrophysics* for 1893, page 799, to which reference is made.

During the past years, Professor WOLF has experimented with all kinds of developers, and concludes that, in respect of the energy of the development, there is little to choose between them. He generally employs *Rodinal* in its commercial form, using ninety parts of water to ten of Rodinal, and not developing too long,—that is, the plate is not allowed to become too dark. By long and careful researches, Professor Wolf also concludes that he can secure somewhat fainter impressions on the plate by a strong developer acting for a short time than by a weak one used for a long development. So-called restrainers, as Sodium-bromide, should not be employed. They produce a clear film, but the fainter impressions are lost.

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* This point was laid before the International Astro-Photographic Congress by Messrs. E. C. PICKERING and STEINHEIL, but such lenses were rejected for the International Map.

These remarks relate to the photography of planetoids, etc., and are not applicable to photographs of nebular *details*, etc., to photographs of the Sun and Moon, etc. In such cases the *Glycin* developer is to be recommended, using *fresh* plates. For planetoids and faint nebulæ, old plates and a rapid development are desirable.

From the tables in Professor Wolf's paper, it results that in

1892,	38	known	and	18	new	planetoids	were	found	by	him.
1893,	27	"	"	9	"	"	"	"	"	"
1894,	15	"	"	6	"	"	"	"	"	"
1895,	19	"	"	3	"	"	"	"	"	"

or, one new planetoid was found

to	2.1	known	planetoids	in 1892.
to	3.0	"	"	" 1893.
to	2.5	"	"	" 1894.
to	6.3	"	"	" 1895.

It would seem, from this table, as if the number of the unknown planetoids as bright as the twelfth magnitude had been materially reduced, though it is probably too soon to draw this conclusion.

When one reviews the work that has been done in this field in order to see how far the photographic method of discovering planetoids has succeeded, the result is most satisfactory:

By means of the photographic method, many new planetoids have been discovered, and, what is at least as important, many old planets which had been "lost" have been re-discovered,—which would hardly have been the case had we depended solely on visual observations.

As in other fields of research, it has been found that photography, so far from doing away with the necessity for visual observations, has, in fact, created new demands upon the former methods, and has increased, not diminished, its scope and usefulness.

In a foot-note, Professor Wolf remarks that he feels obliged, on account of the pressure of other work, and on account of his present state of health, to abandon the field of the discovery of planetoids by photography. In the four years of his work, he has discovered no less than thirty-six new asteroids, and has re-discovered many of those which were "lost," and he may leave the methods which he has created to other most capable observers, well content with his own contributions to this branch of science. By the time the Heidelberg Observatory obtains its pair of great photographic lenses,* it is hoped that Professor WOLF may be in robust health, and ready to use them in new fields. If there is an unknown major planet, the best hope for its discovery is by these lenses or by the BRUCE telescope of the Harvard College Observatory, or by some instrument of like class, with a large field and great light-gathering power.

E. S. H.

(TWENTIETH) AWARD OF THE DONOHOE COMET-MEDAL.

The Comet-Medal of the Astronomical Society of the Pacific has been awarded to Mr. C. D. PERRINE, Assistant-Astronomer in the LICK Observatory for his discovery of an unexpected comet on November 17, 1895.

The Committee on the Comet-Medal,

EDWARD S. HOLDEN,
J. M. SCHAEBERLE,
W. J. HUSSEY.

January 17, 1896.

(TWENTY-FIRST) AWARD OF THE DONOHOE COMET-MEDAL.

The Comet-Medal of the Astronomical Society of the Pacific has been awarded to Professor W. R. BROOKS of Geneva, N.Y., for his discovery of an unexpected comet on November 21, 1895.

The Committee on the Comet-Medal,

EDWARD S. HOLDEN,
J. M. SCHAEBERLE,
W. J. HUSSEY.

January 21, 1896.

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* See *Publications* A. S. P., Vol. VII, p. 285.